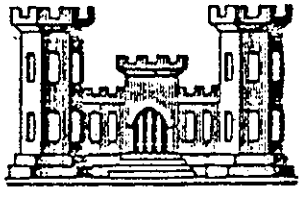
CONNECTICUT RIVER BASIN
ATHOL, MASSACHUSETTS

LAKE ELLIS DAM
MA 00005

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

APRIL 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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4. TITLE (and Subtitle) Lake Ellis Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE April 1981 13. NUMBER OF PAGES 25
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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Athol, Massachusetts

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Lake Ellis Dam is an earth embankment about 140 feet long with a maximum height of about 11 feet. The dam is in fair condition. The culverts under the highway are capable of discharging 2,400 cfs which is equivalent to 77% of the PMF before the highway embankment would be overtopped. The full PMF event would overtop the highway embankment by approximately one foot.

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

TABLE OF CONTENTS

DESCRIPTION

Identification Number:	MA 00005
Name of Dam:	Lake Ellis Dam
Town:	Athol
County and State:	Worcester County, Massachusetts
Stream:	Mill Brook
Date of Inspection:	December 4, 1980

Lake Ellis Dam is an earth embankment about 140 feet long with a maximum height of about 11 feet. Water Street, a hard surfaced road, traverses the crest of the dam which is approximately 20 feet wide. Both the upstream and downstream slopes of the embankment are about 1.5H:1V with trees and brush covering most of the surface. The masonry overflow spillway, which has been blocked off since 1948, never experienced discharge in its 59 year history. All discharges in excess of normal flow from Lake Ellis are directed into South Brook on the south side of the watershed. The Massachusetts Route 2 embankment acts as the dam for the watershed where it crosses the marsh leading to South Brook.

The 27-inch diameter penstock, which used to provide water for the razed Swift River Box Company, is the only source of water to Mill Brook from the watershed above Lake Ellis Dam.

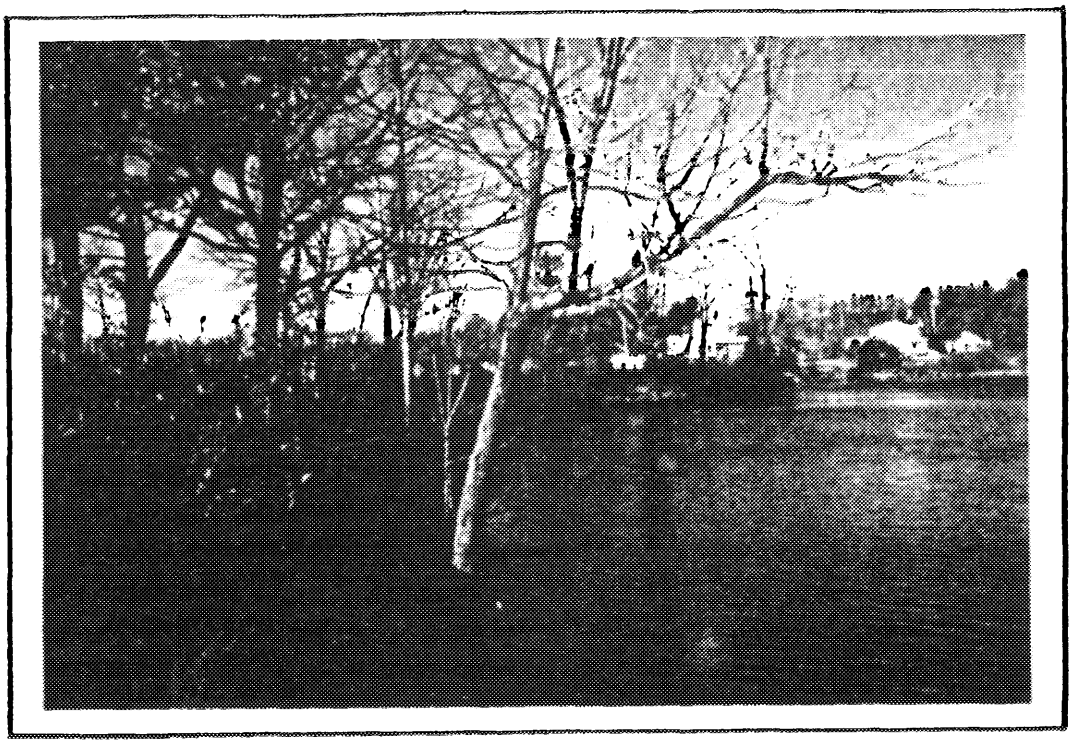
The impoundment is currently used for recreational purposes only.

The general condition of the dam appears to be fair.

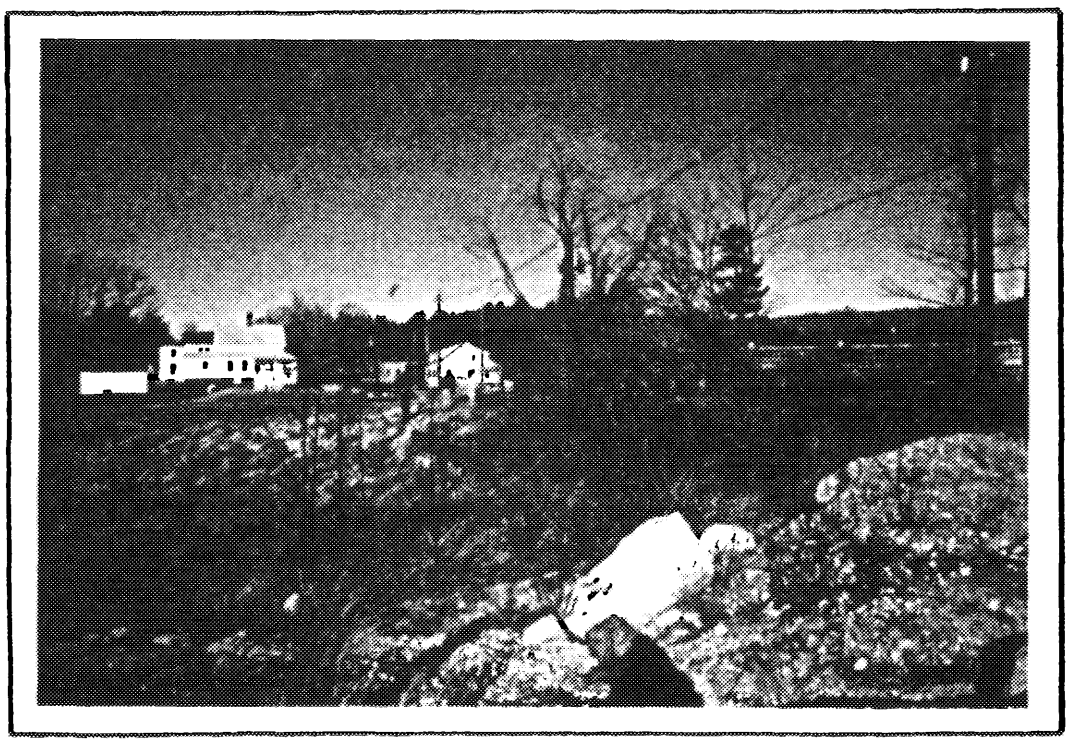
EVALUATION OF HYDRAULIC/HYDROLOGICAL FEATURES

Lake Ellis Dam has a watershed of 3.0 square miles which is better than 90 percent forest covered. The remainder of the watershed is residentally and commercially developed. The terrain is relatively steep ranging from El. 1,388 on the eastern edge of the watershed to El. 832 at normal pool. Lake Ellis Dam does not have a spillway. The storage capacity with the reservoir level at the top of the dam El. 839 is 970 Acre-Feet. On the south side of the watershed the Massachusetts Route 2 embankment, which is 8 feet high with a crest width of approximately 60 feet and side slopes about 4H:1V, acts as the dam for the watershed. The spillway system through the highway embankment consists of three 16-foot wide by 5-foot high culverts.

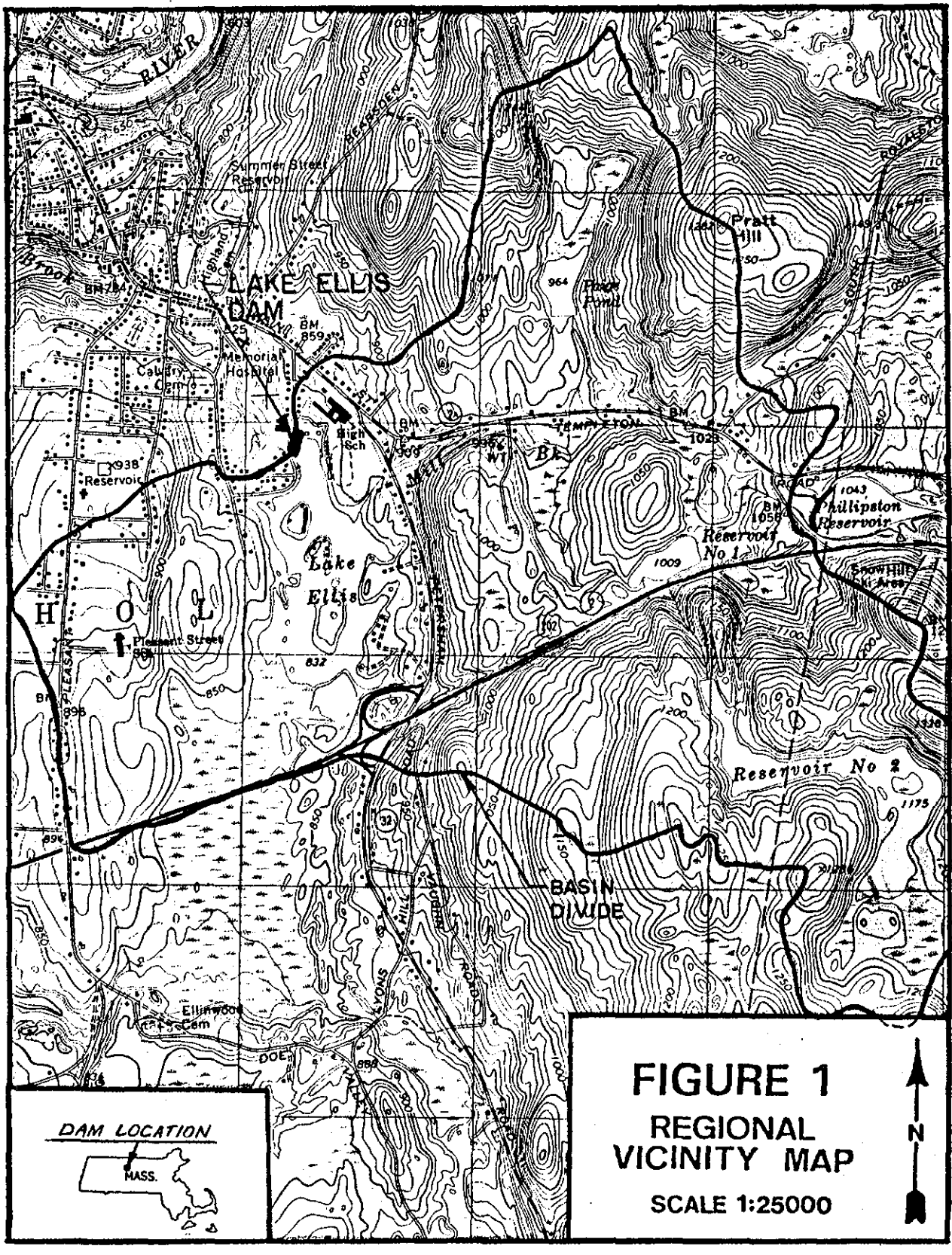
The culverts under the highway are capable of discharging 2,400 cfs which is equivalent to 77 percent of the PMF before the highway embankment would be overtopped. The full PMF event would overtop the highway embankment by approximately one foot.



UPSTREAM OVERVIEW OF THE DAM FROM THE SOUTH ABUTMENT.



DOWNSTREAM OVERVIEW OF THE DAM FROM THE SOUTH ABUTMENT.


LAKE ELLIS DAM
Summer Street Reservoir
Memorial Hospital
Calvary Cem
High Sch
Reservoir
Lake Ellis
Pleasant Street
Pratt Hill
Pond
Reservoir No 1
Chillipston Reservoir
Reservoir No 2
BASIN DIVIDE
Ellinwood Cem
DOE
DAM LOCATION
MASS.
FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:25000
N

APPENDIX **A**

ENGINEERING DATA

From Lord's "History of Athol" supplied by James Tedford of Athol.

Mill Brook

We have no record or tradition as to when or why Mill Brook was so named. It is mentioned in the record of the second contract made by the proprietors with Samuel Kendall at which time so far as we know no power had been developed there, except the saw mill on Freedom Street which originally was purely a Mill Brook power as the canal from the river into its pond was not excavated until some twenty years or more later.

In relating the story of the mills along this brook and the other streams we will (as we have done in the story of South Brook) tell the story in the order of their location, beginning at the head waters rather than by dates of development.

About the middle of the nineteenth century industrial development along Mill Brook made a more steady flow of its waters imperative, and to accomplish this a group of these mill owners planned a series of reservoirs to impound flood waters and release them in periods of drought. This original group consisted of Abram and Ira Oakes, owners at Pegville, Edwin Ellis, owner at Water Street, Festus F. Amsden, then interested at Mechanic Street, Jacob S. Cooke and Laban Morse at Pleasant Street, and Dexter Cheney, an adjoining owner, Theodore Jones at Mechanic Place, Frederick Jones and Milton Baker at Chestnut and Main Streets, and Lyman W. Hapgood at Chestnut and Hapgood Streets.

The first reservoir built by these associates was in Athol, a short half mile south of our former Welfare Home; the next and larger reservoir, known as No. 2, was perhaps a quarter of a mile south of No. 1, its dam being in Athol but much of its flowage area in Phillipston. As this is written, studies are being made looking to the taking of this No. 2 reservoir for an additional source of water for Athol's Municipal Water System.

No. 3 reservoir was built about 1854, on a small brook tributary to Mill Brook and a short half mile northeast of Pegville.

Some time later these associates were incorporated as Athol Water Company, thus forcing Robert and Solon Wiley to adopt another name for their original municipal water system. They chose Athol Acqueduct Company as their name but at a later period Athol Water Company became Athol Reservoir Company and still later Mill Brook Associates and Athol Acqueduct Company became Athol Water Company.

Downsteam from these reservoirs the first industrial plant we come to was at "Pegville", the dam being west of Garfield Road and the mill pond extending well east of that road. Here long ago was a flourishing mill producing a variety of wooden items including shoe pegs. It was operated by Abraham Oakes and later by his son Ira, one George Wilder, and for a short time L. J. Whitney. In early deeds, Abraham Oakes describes himself as a "plough maker" which is not inconsistent with the operating of a woodworking plant as these implements were made entirely of wood previous to around 1835. According to my notes this mill was first taxed in 1833.

When the use of wooden pegs in the manufacture of footwear ceased, this property fell into disuse and was eventually acquired by Athol Water Company and a mechanical water filter installed there. Since the construction of the filter beds off the north end of Hillside Terrace, this power has been entirely idle although the dam is maintained by the Water Department.

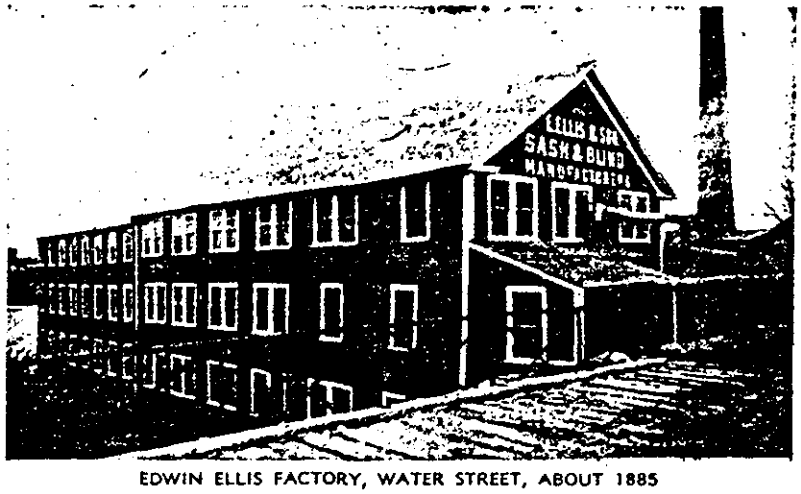
Next below this filter location is a substantial stone dam said to have been built by the Pegville owners when their business seemed to warrant expansion, but my information is that the project was never completed.

Next on the stream and just east of Petersham Road was a substantial reservoir built as an auxiliary to the saw mill below.

The reserve waters from this pond were released into a small fore-bay west of Petersham Road, thereby wasting fully half the available "head" for this mill. Various owners recalled are Edward Drury, William B. Spooner, Orcutt and Samuel D. Prouty, Jonathan Drury, Eric D. Walker, Edmund Moore, Charles H. Butterworth, and T. Sidney Mann the present owner. The land and buildings are utilized by the Mann Lumber Company, but the use of the water power was discontinued some twenty years ago.

Pressing hard upon the tail race of this last named saw mill are the waters of Lake Ellis, the most pretentious development on Mill Brook.

Much of the land covered by these waters was, previous to about 1840, a peat bog from which that fuel was cut at times.



EDWIN ELLIS FACTORY, WATER STREET, ABOUT 1885

Across this bog the road to Templeton and Boston crossed when first laid out in 1754, this section being a cordroy or log road.

June 22, 1843, Timothy Hoar, William Fletcher and Jonathan Kidder acquired some fifteen acres of land which later became a part of the Ellis plant. At approximately where Water Street crosses Mill Brook they built a dam of rather large proportions utilizing the water to produce power for a woodworking mill which they erected west of the dam.

There is some evidence that this mill power was a rejuvenation of a mill power long before developed and abandoned on this site, but the mill pond dates back only to 1843. The entire area was a part of a hundred acre lot (126 acres) laid out to John Ballard on the right of John Fiske and is numbered 47 on the plan.

Kidder, early in 1845, disposed of his share in this enterprise to his partners, and the preponderance of evidence is that later in 1845 Mr. Fletcher likewise retired from the business.

On December 18, 1845, this dam suddenly gave way releasing a large volume of water into Mill Brook. The Hoar factory was destroyed, as were several others down the stream.

Succeeding this disaster, the ownership passed through several hands until finally on March 13, 1852, it became the property of Edwin Ellis, a native of (North) Orange who speedily developed it into a prosperous industry continuing until his death on July 9, 1888. Succeeding him, his family carried on for a time.

In 1889 the Athol Reservoir Company entered upon a plan to improve the water powers of Mill Brook by increasing many fold the storage capacity of Lake Ellis.

It acquired the old Ellinwood dam and power on Doe Valley Road, got assents to flow intervening land, and asked the town of Athol, in the guise of improving Water Street, to rebuild the Ellis dam raising its spillway three feet, giving assurance that if this could be done the reservoir company would attend to all other details including land damages and the building of a new dam at Doe Valley Road with the spillway the same height as that contemplated at Lake Ellis. Against the better judgment of many citizens the appropriation was made and the prosecution of the work delegated to Gardiner Lord, Orrin F. Hunt and Henry Grey, its Selectmen, with the addition to the committee of James M. Lee, O. A. Fay and James F. Whitcomb.

The Water Street job was completed in 1889 as directed by the town, the spillway was raised the full three feet and an iron bridge constructed carrying Water Street across the dam, but none of the waters of Lake Ellis have ever flowed over that spillway for the agreement of Athol Reservoir Company was not kept and no dam was built at Doe Valley Road.

The bridge at Water Street was maintained until 1948 when it was removed and an earthen roadway constructed above the spillway.

The 1889 construction provided for a pen stock into the Ellis Plant and through this for sixty years a moderate supply of water has been released into Mill Brook, but all surplus or flood waters have found their way into South Brook and through it into White Pond, Rohunta and Millers River.

Adverse economic conditions eventually proved to be the undoing of the Ellis family. To add to their troubles the plant was destroyed by fire on May 15, 1896, but was rebuilt and was again in operation in less than a year. Bankruptcy proceedings ensued in late 1897 and the plant was sold at auction to Alfred J. Raymond and Millard W. White, both of Royalston; Mr. Raymond also purchasing the Ellis homestead at 1405 Main Street.

Mr. White soon retired from the business leaving Mr. Raymond as sole owner and he carried on an active business there for some thirty years.

Eventually financial difficulties overtook Mr. Raymond also and the plant again went under the auctioneer's hammer.

After a relatively short period of idleness it was acquired by Swift River Box Company, a refugee from North Dana which village was wiped out by the huge Quabbin Reservoir project and by this company active operations are still continued there but it is many years since the water power at this plant has been utilized.

INSPECTION REPORT & DATA FOR DAMS Jan 1972

Dam No. 02-13
Town: Athol
Stream: Mill Brook
Pond: Lake Ellis
Date: 1-11-72
By: Eaton & Canty

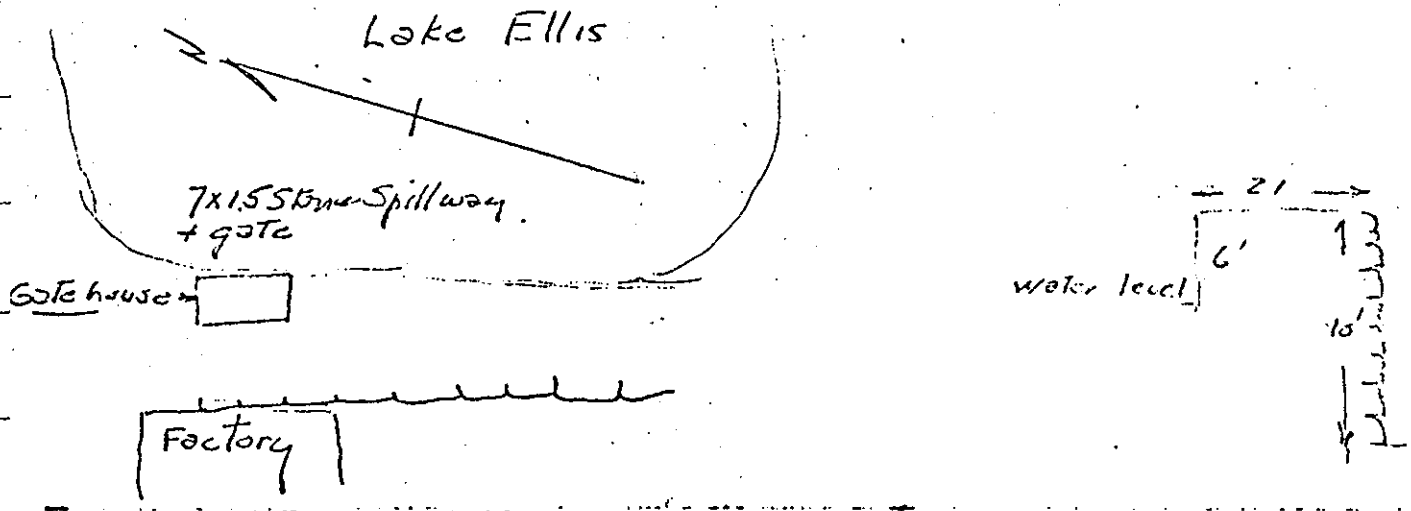
Owner: Swift River Box Co.
His Address:
Function of Dam: Recreation

Location & Access: On Lake Ellis Rd 0.2 miles So of Main St.
USGS Quad. Athol Lat. 42°34'50" Long. 72°12'20"
Drain.Ar. 4.32 Sq.Mi.; Ponds: 52 ac.; Res.@dam:
Character of D.A.:
Y 2.87
Estimated
Discharge
Capacity:

CONDITION RATING
Structural: Good
Hydraulic: 7x1.5
General: Good
PRIORITY: X

General Description of Dam and Discharge Control:
Earth filled stone faced on down stream side
Gate house (locked) maintaince man says gates probably don't work

Sketch (Not to Scale):



Remarks and Recommendations:
Small leaks noted. Trees + brush on dam should be cut. Water level maintained 3'± below small spillway. Only outlet presently used goes through pipe in boiler room probably broken

Date 1-4-72 By Eaton & Canty Comment

Dam No. 3-14-15-13

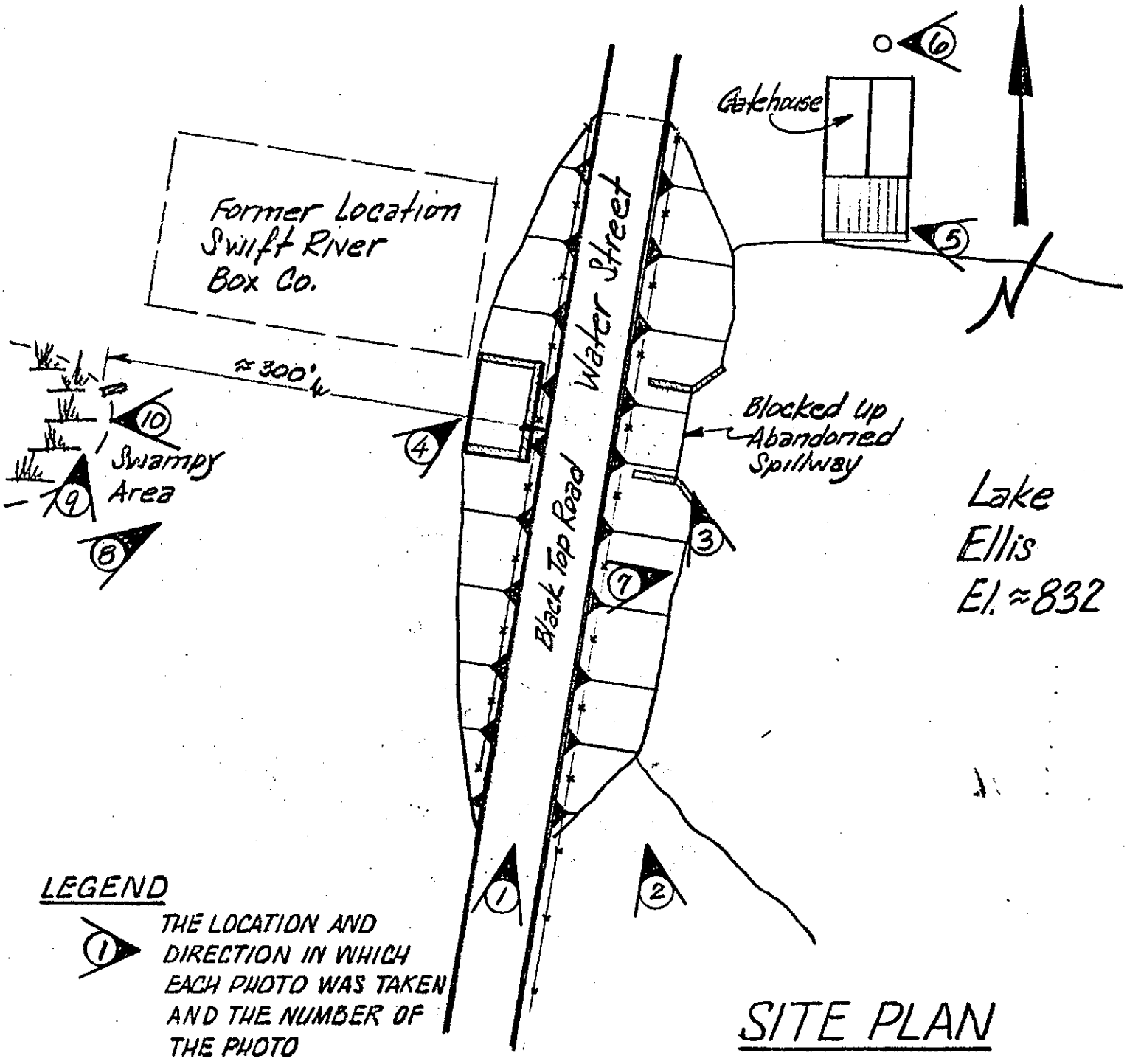
APPENDIX B

PHOTOGRAPHS

APPENDIX B
SELECTED PHOTOGRAPHS OF THE PROJECT

O'BRIEN & GERE
ENGINEERS, INC.

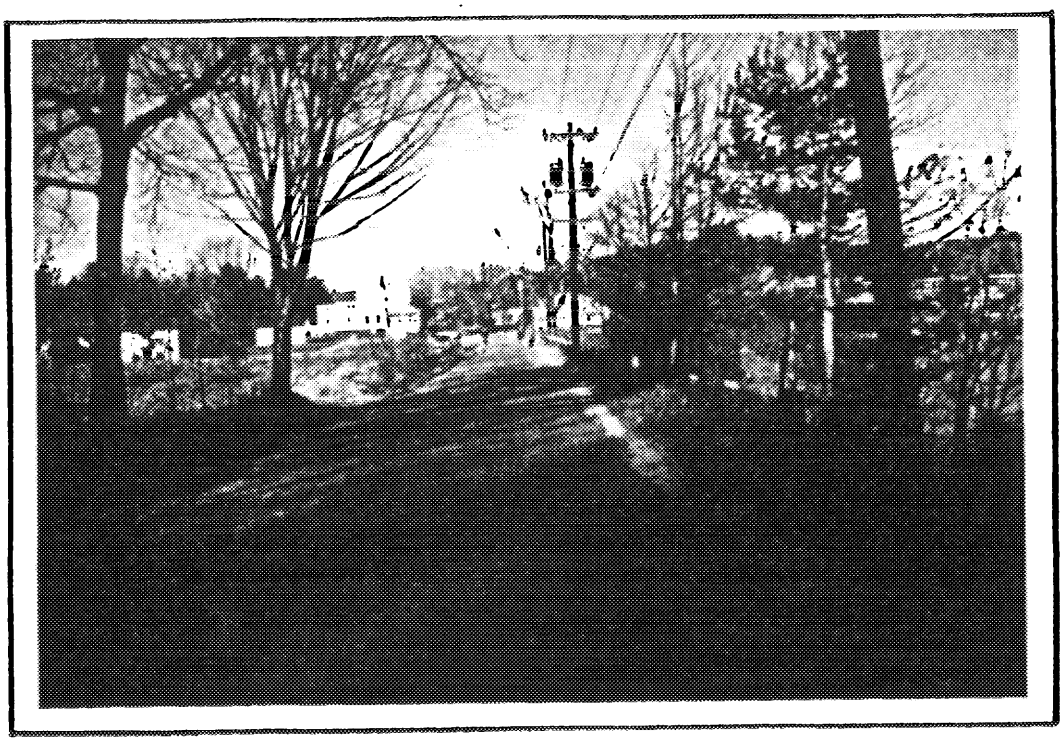
SUBJECT	SHEET	BY	DATE	JOB NO
Lake Ellis Dam	A			



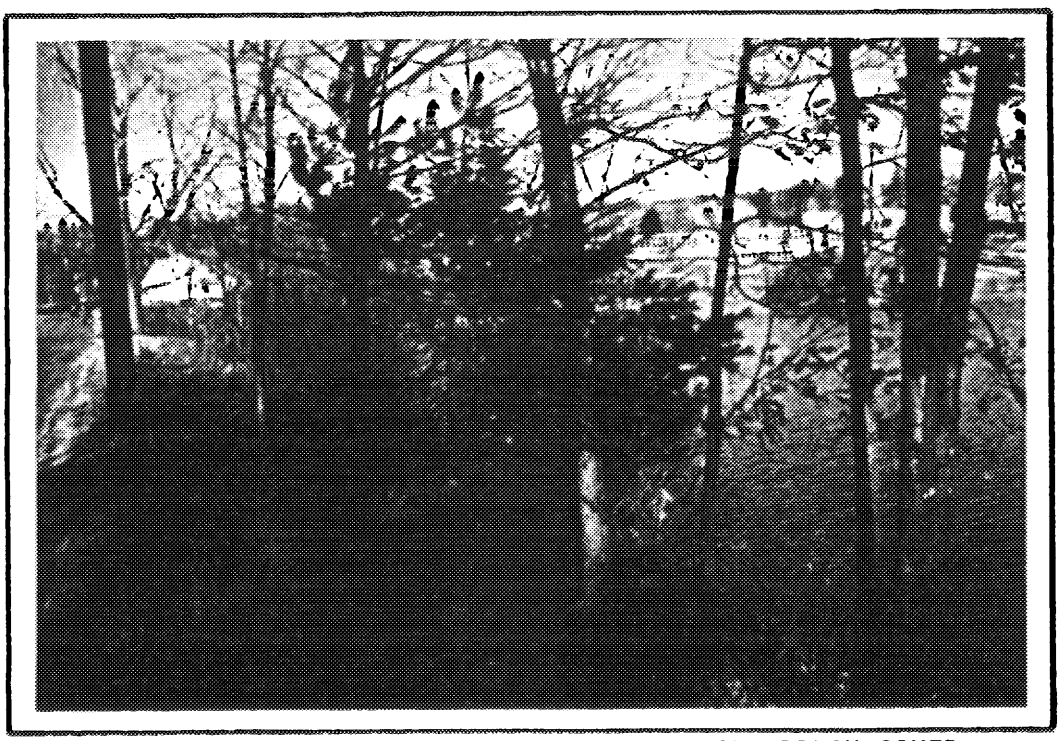
LEGEND

(1) THE LOCATION AND DIRECTION IN WHICH EACH PHOTO WAS TAKEN AND THE NUMBER OF THE PHOTO

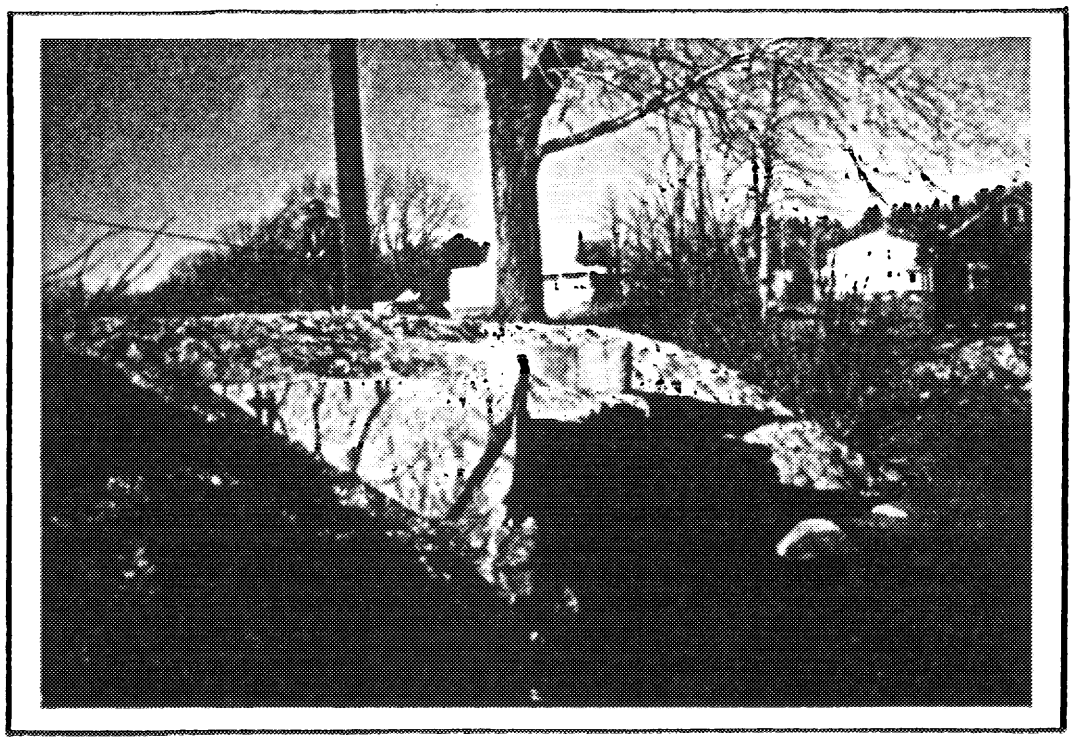
SITE PLAN



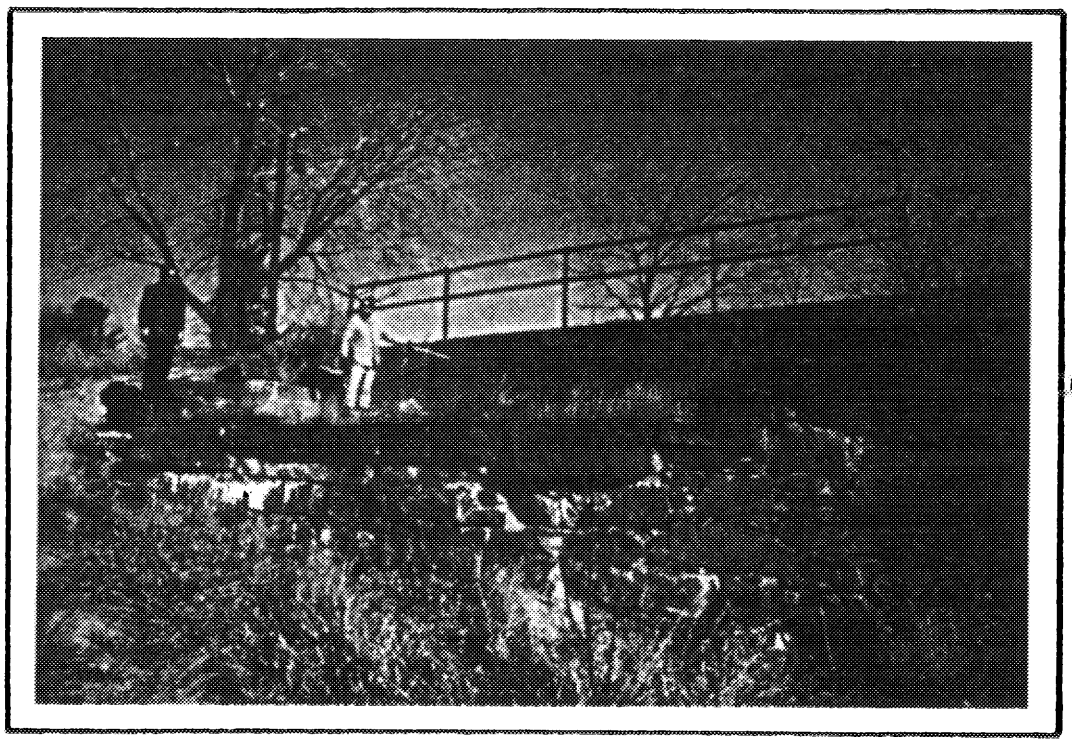
1. VIEW ALONG THE CREST OF THE DAM FROM THE SOUTH ABUTMENT. (12/4/80)



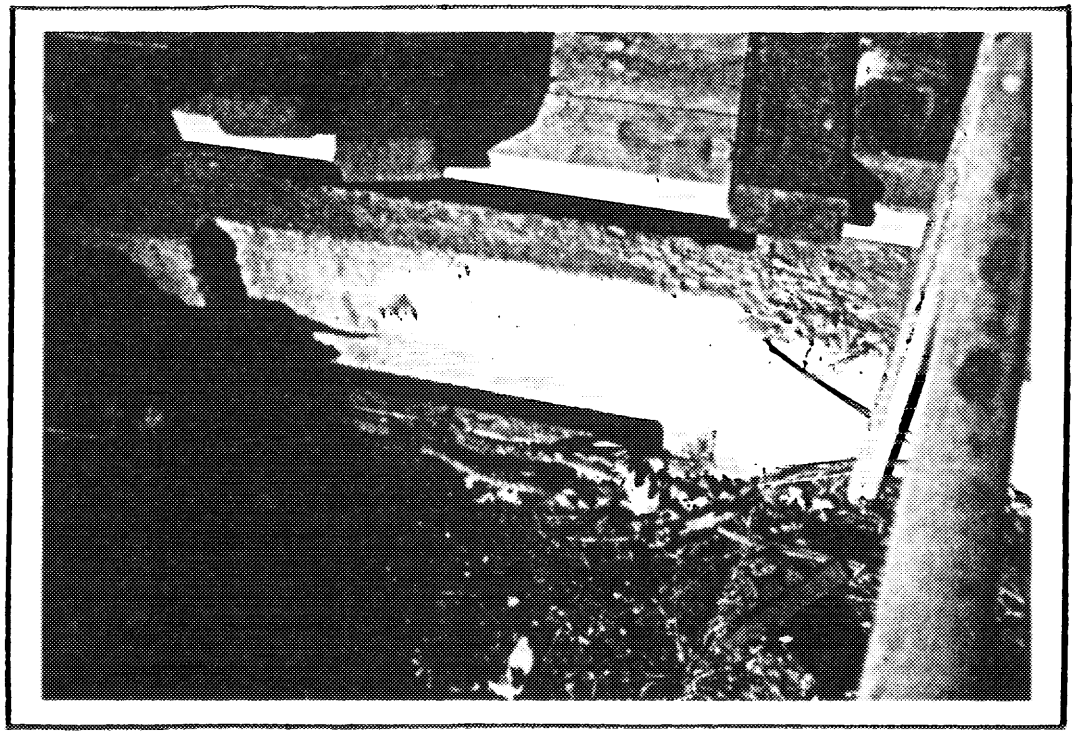
2. UPSTREAM FACE OF THE DAM SHOWING TREE AND BRUSH COVER. (12/4/80)



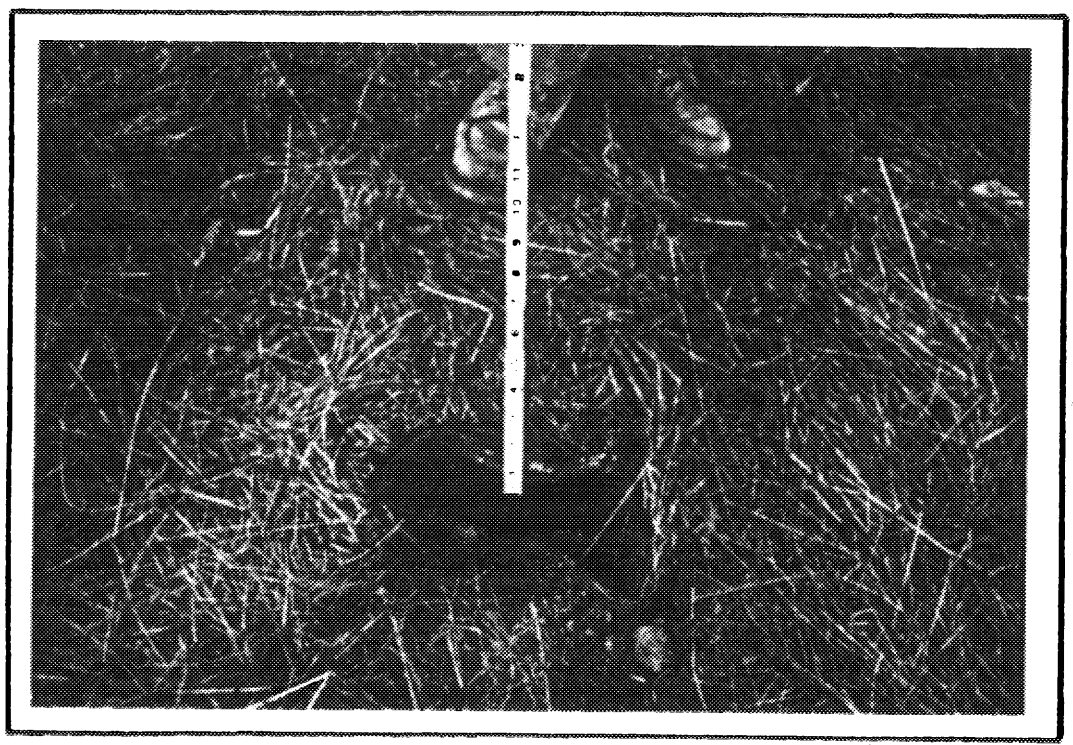
3. INLET TO SPILLWAY WHICH HAS BEEN BLOCKED OFF. (12/4/80)



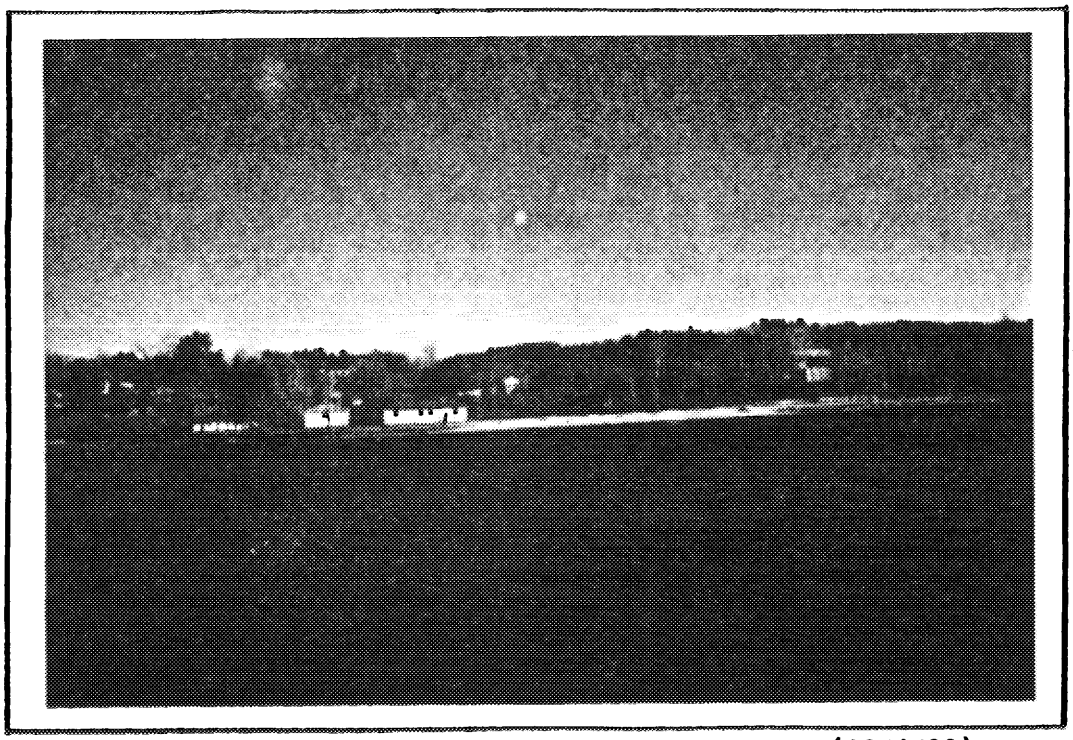
4. DOWNSTREAM SIDE OF THE SPILLWAY WHICH HAS BEEN BLOCKED OFF. (12/4/80)



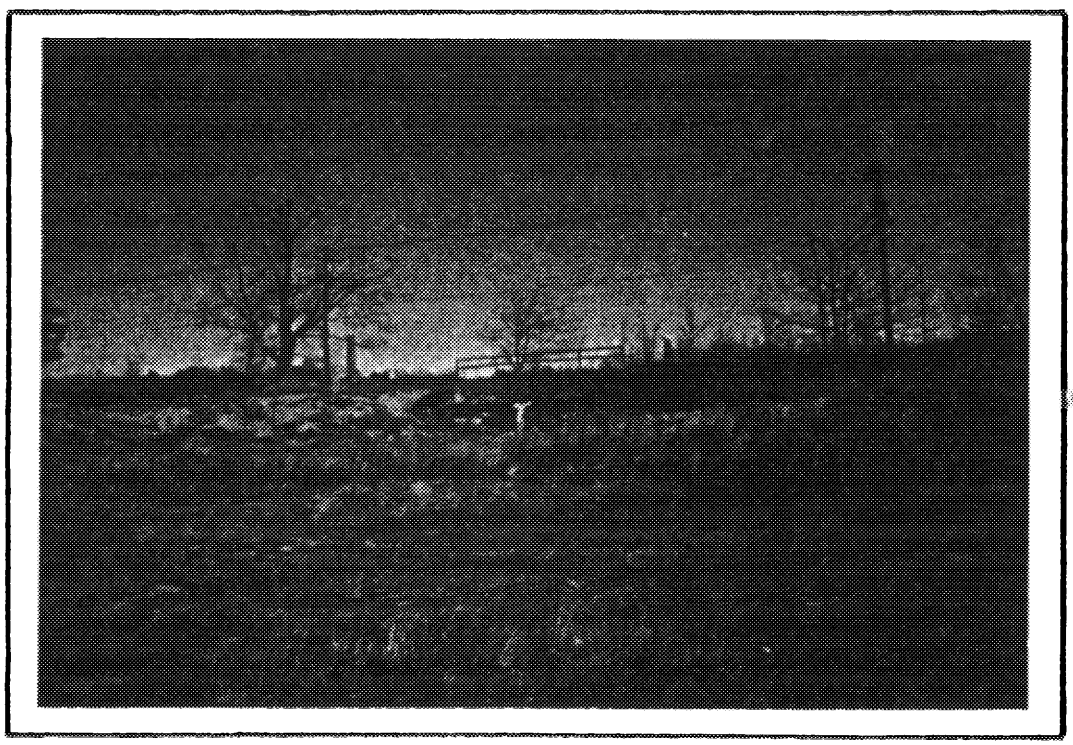
5. RECENT CONSTRUCTION IN THE VICINITY OF THE GATEHOUSE. (12/4/80)



6. CONDUIT FOR VALVE STEM NEAR GATEHOUSE. (12/4/80)

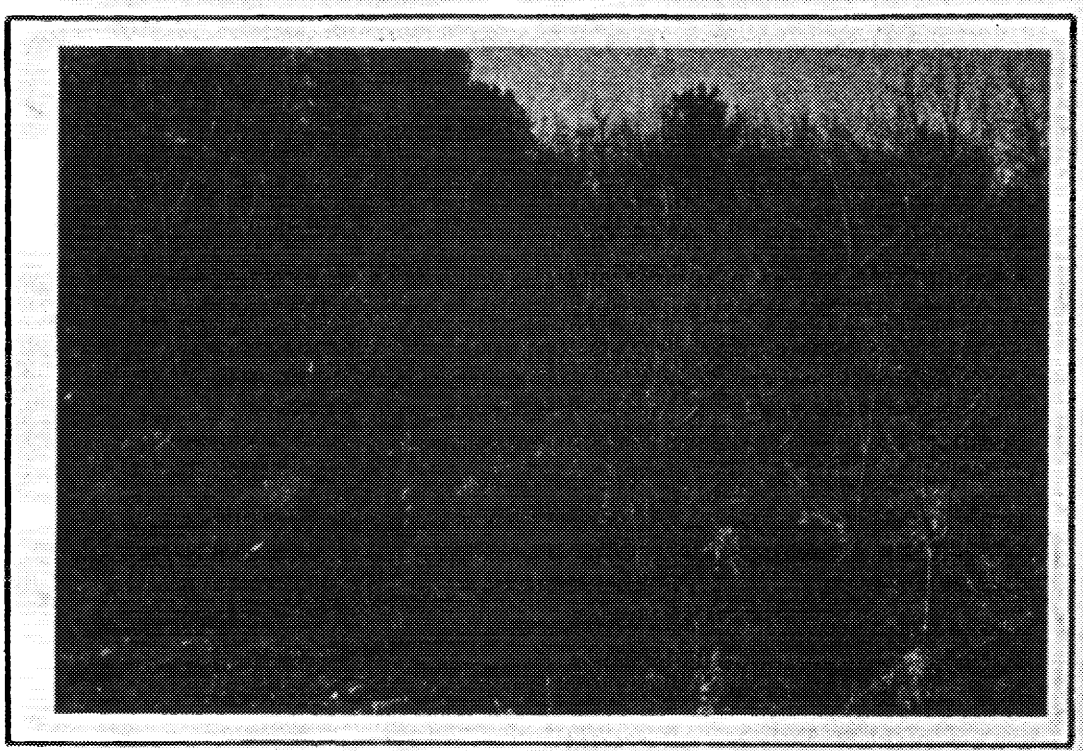


7. OVERVIEW OF ELLIS LAKE AS SEEN FROM THE DAM. (12/4/80)



8. FORMER OUTLET CHANNEL OF THE FORMER SPILLWAY. (12/4/80)

9. OUTLET OF 27-INCH METAL PIPE ABOUT 300 FEET DOWNSTREAM OF THE DAM. (12/4/80)



10. TYPICAL CHANNEL CONDITIONS DOWNSTREAM OF THE 27-INCH METAL PIPE OUTLET.

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO.
Lake Ellis	1	[illegible]	2/24/81	2060.002

Hydrologic & Hydraulic Computations

Drainage Area = 3.0 mi²

Reservoir Area - From USGS Quad.

	Area (Acres)	Storage* (AF)
Assume Bottom of Impoundment ≈ El. 820	0	0
Normal Reservoir Surface ≈ El. 832	66	264
		970
Crest Lake Ellis Dam & Crest Rf. Z Emb. ≈ El. 839	140	1115
El. 840	152	

*Storage Formula $S = H/3(A_1 + A_2 + \sqrt{A_1 A_2})$

H = incremental height

S = " storage

Snyder Hydrograph Coefficients

$C_t = 2.0$, $C_p = 0.6$

$L = 3.7$ miles, $L_{ca} = 1.9$ miles

$\therefore T_p = C_t (L \cdot L_{ca})^{0.3}$

$= 2 (3.7 \times 1.9)^{0.3}$

$T_p = 3.6$ hrs.

PMP Data

From HMR #33, 24 hr. 200 mi² = 20.5"

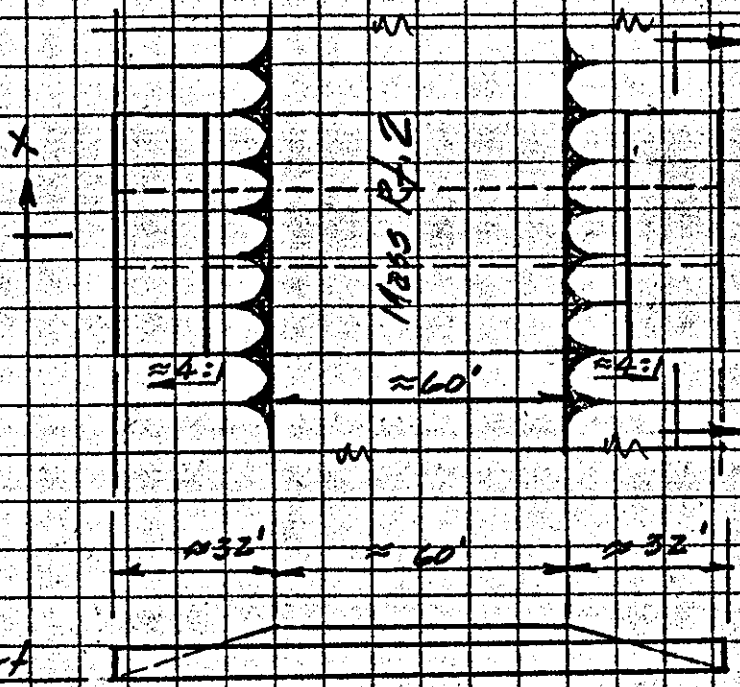
Distribution

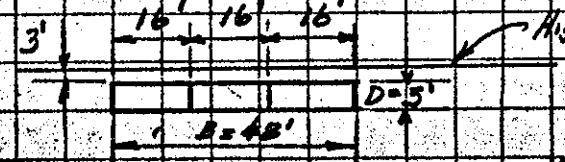
6 hr.	111 %
12 hr.	123
24 hr.	133
48 hr.	142

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO.
Lake Ellis	2	BS	2/24/81	2060-002

Spillway @ Mass. Rt. 2





Discharge Thru Triple Culverts

Assume inlet control because culverts outlet into marsh area at least 1500' wide

D = 5', B = 48' Refer to Ch. 14, 6. Pg 14.62, SCS, NEH 4

Elev.	HW (Ft.)	HW/D	B/B	Q (cfs)
832.5	1.5	0.30	7	330
833.5	2.5	0.50	14	670
835.0	4.0	0.80	24	1150
837.0	6.0	1.20	39	1870
839.0	8.0	1.60	50	2400
840 road surface	9.0	1.80	54	2570
841.0	10.0	2.0	58	2780

Total Q Values	
Elev.	Q (cfs)
831.0	0
832.5	330
833.5	670
835.0	1150
837.0	1870
839.0	2400
840.0	3990
841.0	7530

Discharge over Top of Highway Emb. $Q = CLH^{3/2}$, $C = 2.8$, $L =$

@ El. 840.0 $H = 1'$, $L = 500'$, $Q = 2.8 \cdot 500 \cdot 1^{3/2}$

$= 1400$ cfs

@ El. 841.0 $H = 2'$, $L = 600$, $Q = 2.8 \cdot 600 \cdot 2^{3/2}$

$= 4750$

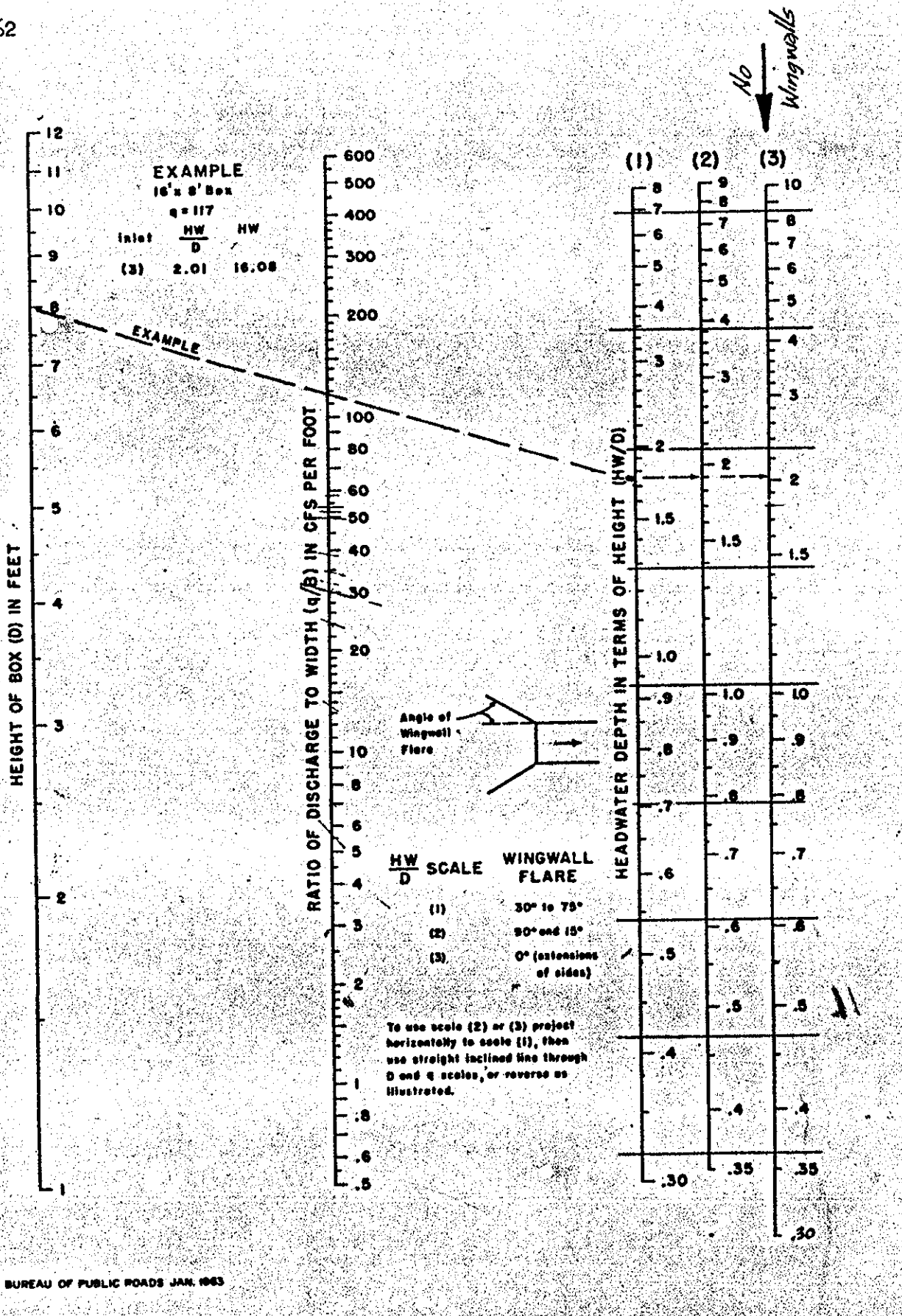


Exhibit 14.6. Headwater depth for box culverts with inlet control.

From: Soil Conservation Service
National Engineering Hdbk 4

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C>LIST,F=ELLOUT
 JANUARY 9, 1981
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 - HEC-1 DAM SAFETY VERSION (HEC1DB)

 THE NEW VERSION OF HEC1DB WAS INSTALLED ON
 JANUARY 9, 1981.  SOME OF THE COMPUTATIONAL METHODS HAVE
 BEEN REVISED, AND RESULTS MAY BE DIFFERENT FROM THOSE
 OBTAINED FROM THE CURRENT VERSION.  THERE IS NO CHANGE
 IN INPUT DATA REQUIREMENTS.

 - HEC-5C

 HEC-5C WILL BE AVAILABLE APPROXIMATELY JANUARY 23, 1981.
 IF YOU NEED ACCESS BEFORE THEN, CALL ALLEN JOHNSON.

1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********
     1                A1                    HYDROLOGIC ANALYSIS OF LAKE ELLIS DAM
     2                A2                         NATIONAL DAM SAFETY PROGRAM
     3                A3                    NEW ENGLAND DIVISION - CORPS OF ENGINEERS
     4                B    300       0      10       0       0       0       0       0      -4       0
     5                B1     5
     6                J      1       9       1
     7                J1    .2      .3      .4      .5      .6      .7      .8      .9     1.0
     8                K      0  INFLOW       0       0       0       0       1
     9                K1                                INFLOW TO LAKE ELLIS
    10                M      1       1    3.0       0     3.0       0       0       0       1
    11                P      0    20.5     111     123     133     142
    12                T                                                       0     .05
    13                W    3.6     0.6
    14                X   -1.7    -0.1       2
    15                K      1  OUTFLO       0       0       0       0       1
    16                K1                        ROUTED OUTFLOW FROM LAKE ELLIS DAM
    17                Y                                 1       1
    18                Y1     1                                                 831      -1
    19                Y4   831   832.5   833.5     835     837     839     840
    20                Y5     0     330     670    1150    1870    2400    3990
    21                $A     0      66     140     152
    22                $E   820     832     839     840
    23                $$   832
    24                $D   839
    25                K     99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                  RUNOFF HYDROGRAPH AT      INFLOW
                                  ROUTE HYDROGRAPH TO       OUTFLO
                                  END OF NETWORK


1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********

 RUN  DATE* 81/02/25.
      TIME* 11.47.46.
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NATIONAL DAM SAFETY PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .20 .30 .40 .50 .60 .70 .80 .90 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO LAKE ELLIS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	3.00	0.00	3.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.50	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 3.60 CP= .60 NTA= 0

RECESSION DATA
STRTQ= -1.70 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 3.58 HOURS, CP= .61 VOL= .98

3.	13.	27.	43.	61.	81.	103.	125.	148.	172.
196.	221.	245.	266.	284.	300.	313.	324.	332.	337.
339.	338.	332.	321.	306.	292.	279.	266.	254.	242.
231.	220.	210.	201.	192.	183.	174.	166.	159.	152.
145.	138.	132.	126.	120.	114.	109.	104.	99.	95.
90.	86.	82.	79.	75.	72.	68.	65.	62.	59.
57.	54.	52.	49.	47.	45.	43.	41.	39.	37.
35.	34.	32.	31.	29.	28.	27.	26.	24.	23.
22.	21.	20.	19.	18.	18.	17.	16.	15.	15.
14.	13.	13.	12.	12.	11.	10.	10.	10.	9.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.29	21.54	1.74	227240.
										(592.)	(547.)	(44.)	(6434.72)

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HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM LAKE ELLIS DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTFLO	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-831.	-1

STAGE	831.00	832.50	833.50	835.00	837.00	839.00	840.00
FLOW	0.00	330.00	670.00	1150.00	1870.00	2400.00	3990.00
SURFACE AREA=	0.	66.	140.	152.			
CAPACITY=	0.	264.	969.	1115.			
ELEVATION=	820.	832.	839.	840.			

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
832.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
839.0	0.0	0.0	0.

PEAK OUTFLOW IS 724. AT TIME 45.17 HOURS

PEAK OUTFLOW IS 1064. AT TIME 45.17 HOURS

PEAK OUTFLOW IS 1406. AT TIME 45.17 HOURS

PEAK OUTFLOW IS 1734. AT TIME 45.33 HOURS

PEAK OUTFLOW IS 2009. AT TIME 45.50 HOURS

PEAK OUTFLOW IS 2252. AT TIME 45.67 HOURS

PEAK OUTFLOW IS 2738. AT TIME 45.33 HOURS

PEAK OUTFLOW IS 3389. AT TIME 45.00 HOURS

PEAK OUTFLOW IS 3952. AT TIME 44.67 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	INFLOW	3.00	1	982.	1473.	1964.	2455.	2946.	3437.	3928.	4419.	4910.
		(7.77)		(27.81)(	41.71)(	55.62)(	69.52)(	83.42)(	97.33)(	111.23)(	125.14)(	139.04)
ROUTED TO	OUTFLO	3.00	1	724.	1064.	1406.	1734.	2009.	2252.	2738.	3389.	3952.
		(7.77)		(20.50)(	30.14)(	39.83)(	49.11)(	56.88)(	63.77)(	77.53)(	95.95)(	111.92)

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SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	831.00	832.00	839.00
STORAGE	203.	264.	969.
OUTFLOW	0.	220.	2400.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	833.67	0.00	387.	724.	0.00	45.17	0.00
.30	834.73	0.00	478.	1064.	0.00	45.17	0.00
.40	835.71	0.00	573.	1406.	0.00	45.17	0.00
.50	836.62	0.00	670.	1734.	0.00	45.33	0.00
.60	837.52	0.00	776.	2009.	0.00	45.50	0.00
.70	838.44	0.00	893.	2252.	0.00	45.67	0.00
.80	839.21	.21	999.	2738.	2.17	45.33	0.00
.90	839.62	.62	1058.	3389.	3.83	45.00	0.00
1.00	839.98	.98	1111.	3952.	4.83	44.67	0.00

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1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
 **********************************
 EOI ENCOUNTERED.
C>BYE
 JOB PROCESSING CCUS      3.464
BYE  81/02/25. 12.23.27.

select desired service:
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